Linda Different-Cloud

# Bacteria

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| Grade Level | 7-9 |
| Subject Areas | (Microbiology, Ecology, Botany, Scientific Method, Native Science) |
| Skills | (hypothesizing, observation, lab procedure, comparison, cultural relevancy) |
| Duration | (Preparation Time: 2 hours / Activity Time: Day 1: 50 min., Day 2: 15 min.) |
| Setting | (classroom) |
| Vocabulary | (Microorganisms, Microbiology, Bacteria, Viruses, Petri dish, agar, Antibacterial/Antimicrobial, Antibiotic, Antiseptic/Bacteriostatic, Disinfectant/Bacteriocidal) |
| Objectives | Students will:<br>● Learn to hypothesize about the effect of antimicrobial agents on bacteria.<br>●Learn how to handle bacteria.<br>●Learn about the contributions of Montana's native peoples to contemporary scientific issues |
| Materials | ● Agar plates - nutrient agar is fine<br>●Bacteria – Bacillus subtilis works well<br>●Two to four types of plant materials – use a combination of known antibacterial plants and also a plant(s) that is known to be ineffective, so that students can make comparisons. Make sure to use at least one plant that is important to Montana tribes. (Suggestions: Monarda fistulosa, Echinacea angustifolia, Garlic, Wild onions, cayenne, cinnamon) |
| Background | • Bacteria are everywhere. They are able to multiply quickly and although most are either beneficial or benign to humans, some are pathogenic. Remind the students of various pathogenic examples such as *Salmonella* and *E. coli*. Demonstrate the importance of maintaining good aseptic technique. Remind them that, even though the bacteria they will be working with in this lab are not pathogenic, extreme care must still be taken to ensure that the cultured bacteria stay in the sealed Petri dishes and not get into them. Hand washing is critical, even if they are wearing surgical gloves.<br>• In our struggle to control the microbes responsible for |

decay and disease, humans have discovered many materials that inhibit microbial growth and activity, while others materials are lethal and kill microorganisms. Antiseptics are inhibitory chemicals and are described as *bacteriostatic.* They are generally used to cleanse skin and topical wounds since they stop bacterial growth without killing the underlying tissue the bacteria are trying to grow on. Disinfectants are *bacteriocidal*. They do kill living cells, eukaryotic as well as prokaryotic; therefore disinfectants shouldn't be applied to living tissue.

- Although Western medicine has discovered a number of antimicrobial compounds that are used to save millions of people every year, indigenous peoples all over the world have also been using antibacterial agents for thousands of years. In fact, right here in Montana, tribes have discovered a number of very effective antibacterial plants that may be useful for today's health issues.

Procedure

1. First, disinfect your desktop as directed by your teacher.
2. Next, you will receive a sterile Petri dish with nutrient agar medium. **Do Not** open the Petri dish until you are ready to inoculate it with the bacteria.
3. Mark three or four equal, pie-shaped quadrants on the bottom of the plate with a permanent marker. Label each section with the name of a plant that you want to test.
4. Turn the Petri dish over and inoculate it with the bacteria you receive from your teacher. Make sure to cover the entire surface in a gentle "swiping" motion. Turn the dish several times to swipe in different directions.
5. Using forceps or small spoons, put a very small amount of each plant material in the appropriate quadrant.
6. Place the lid on the inoculated agar plate and tape it shut with a small piece of tape on each side of the dish. **Do Not** run tape completely around the circumference of the dish.
7. Incubate the Petri dish at 37º, **agar side down,** until the following lab period.
8. Make observations and drawings of your plate.
9. Measure and compare the diameters of the areas of inhibition of growth around each plant material. Record this data in a table in the data section of your lab report.

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| **Assessment** | Write a summary paragraph explaining:<br>a. what you learned<br>b. why the knowledge is important<br>c. what you liked best about the inquiry/experiment<br>d. how the activity could be improved) |